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Precision Strong-field Gravity Tests with the Double Pulsar INGRID STAIRS, University of British Columbia — The only known double-pulsar system has a number of unique features, including an extremely relativistic 2.5-hour orbit and an orbital inclined nearly edge-on to the line of sight. Our collaboration has been timing this system for over 16 years with various telescopes and now need to take into account higher-order relativistic effects when modelling and interpreting the data. The new phenomena observed include relativistic deformation of the orbit and next-to-leading-order effects on the Shapiro delay (retardation) and the aberration (gravitational signal deflection). It is also necessary to account for the Lense-Thirring effect (relativistic spin-orbit coupling) when interpreting the advance of periastron, leading to a constraint on the equation of state of super-dense matter. We have achieved the most precise test to date of the general-relativistic quadrupolar decription of gravitational waves, finding agreement with GR at a level of 0.013% with 95% confidence.

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